



MEMORANDUM

DATE: February 2, 2015

TO: SJRIP Biology Committee

FROM: Brian Westfall & Ron Bliesner

SUBJECT: Review of Modeling Analysis of Navajo Operations Proposed Modification of Available Water Calculation for Determining Spring Peak Releases on the San Juan River

We would like to thank Reclamation, and particularly Susan Behery, for developing a model and the documentation that describes Reclamation's proposal to modify the available water calculation used in the decision tree. We originally understood this to be a minor change in the available water calculation with the flow recommendations and the existing decision tree being implemented as usual. We have found this change as modeled to also include a change in the decision tree which is a more significant change in the implementation of the current flow recommendations than we originally understood it to be. We present a revised decision tree in this document based on Reclamation's proposed operation to demonstrate this change. The purpose for this memo is not to be critical of Reclamations work. Just the opposite, we support Reclamation in implementing this change as an interim measure while the flow recommendations are more fully evaluated and modified but feel all should be aware of the impact to the existing flow recommendations.

Reclamation has suggested a minor change in the available water calculation as presented in the following two equations:

The current equation is:

$$Storage_t + \sum_t^{Sept\ 30} Inflow - \sum_t^{Sept\ 30} Releases\ to\ meet\ TBF - \sum_t^{Sept\ 30} Evaporation - \sum_t^{Sept\ 30} NIIP\ Diversions - Carryover\ Storage = Available\ Water$$

The proposed equation is

$$Storage_t + \sum_t^{Sept\ 30} Inflow - \sum_t^{Sept\ 30} Releases\ to\ meet\ TBF - \sum_t^{Sept\ 30} Evaporation - \sum_t^{Sept\ 30} NIIP\ Diversions - EOWYST = Available\ Water$$

It is clear that the change in the equation is in name only. The bigger change is in the magnitude of the number. Over the last several years 900,000 ac-ft has been used as the "Carryover Storage" in the current calculation of available water. This corresponds to a Navajo Reservoir water surface elevation of 6018.8 ft. The proposed change would increase this value, now referred to as "End of Water Year Storage Target" (EOWYST) to somewhere between 6052 ft and 6068 ft (1,249,200 to 1,453,100 ac-ft). The proposed plan would then release water from the reservoir when needed to achieve the selected

storage target by the end of September. This computation sets the stage for selecting the spring release. Since it is set much higher than the current operation, it may also trigger additional releases after the peak when summer/autumn inflow exceeds the forecast.

The "Carryover Storage" value was designed to be changed based on basin depletion per the 1999 flow recommendations (See Table 8.4 in the Flow Recommendations). Hence, this is just a change to the available water calculation and we would not classify this as a major change in the flow recommendations, although increasing the target elevation as recommended by Reclamation changes the frequency of the various releases outlined in the 1999 flow recommendations.

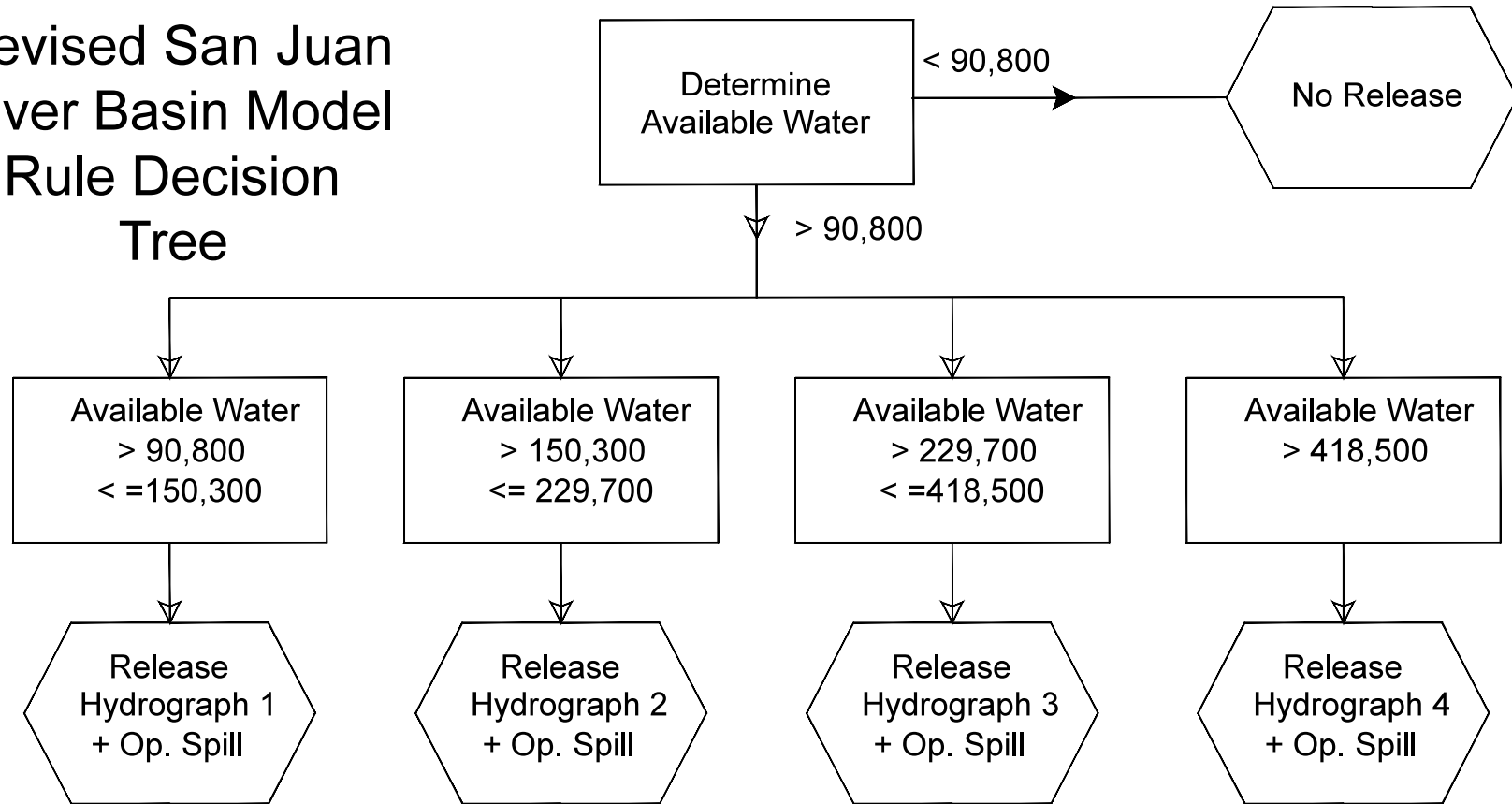
Page 5 of the Reclamation document shows the decision tree from the 1999 flow recommendation that is currently in use. Once available water is calculated there are several tests in this decision tree that look at previous years' hydrology and previous spring peak releases in guiding the selection of the release pattern. Some of the tests look back for three years. The reason for looking at the recent history was to meet certain flow conditions that the Biology Committee deemed important to the fish at the time. If there was a perturbation, for example, it would push a small release to clean cobble bars. The secondary reason was to mimic a natural hydrograph and meet the lower end flow statistics (2,500 and 5,000). None of the look back was specifically driven to save water for a big release.

Attached is our interpretation of the decision tree that Reclamation is proposing to implement. It is a significant change to the flow recommendation in that there is no consideration of previous year releases in making the current year release. The selected spring peak hydrographs in the attached decision tree are based on the existing flow recommendations. The volumes are somewhat different than those in the existing decision tree because of the ramps (ramp up to and down from 5000 cfs) and the inclusion of base flow. The 1999 Flow Recommendation spring peak release volumes excluded base flow in the computation, computing the volume on top of the base flow. The resulting releases include more years without any release and fewer small releases. The 2005 flow recommendation evaluation found these smaller releases to be ineffective and recommended adjusting the decision tree to remove the focus on these small releases to allow an increase in the frequency of the larger releases. The Reclamation proposal, while not directed at this change, results in the same outcome.

Reclamation is also proposing a change in how operational spills are managed. The flow recommendations suggest maintaining 500 cfs from Farmington to Lake Powell. Operational spill was to be released in the fall as a spike release. Reclamation's current suggested operation is to first increase target base flows during the summer and make a fall spike release if necessary to achieve the EOYWST. The biological implications of this change should be discussed prior to implementation.

We view these modifications as a more significant change in the flow recommendations that originally represented. As stated previously we support testing this operation until a full analysis can be done on the existing flow recommendations. We also support the underlying reason for making this change, which is to hold water in Navajo and decrease the chance of being forced into a shortage sharing situations because of potentially making ineffective spring peak releases.

Revised San Juan River Basin Model Rule Decision Tree



Notes on Spring Peak Releases (SPR):

Hydrograph 1: 1-week at 5,000 cfs with 3 day ramps up and down: 90,843 af

Hydrograph 2: 2-weeks at 5,000 cfs with 3 day ramps up and down: 150,347 af

Hydrograph 3: 3-weeks at 5,000 cfs with 3 day ramps up and down: 229,686 af

Hydrograph 4: Full Hydrograph, 3-weeks at 5,000 cfs with full ramps: 418,512 af

Operational spill (Op. Spill) = (Available water - SPR) Released as nose water if full hydrograph (4) was selected and then remaining water is released as an increase in target base flows and then a fall spike release. For Hydrographs 1 to 3, released first as increase in target base flow and then fall spike release.